AMENDMENT NO. 1 DECEMBER 2018
TO
IS 16833 : 2018 AUTOMOTIVE TRACKING DEVICE (ATD) AND INTEGRATED SYSTEMS

(*Page* 2, *clause* **4.14**) — Insert the following at the end of the clause:

'**4.15 Assisted GPS (A-GPS)** — A system allowing satellite receivers to obtain information from communication network resources to assist in acquiring satellite location. A-GPS system is especially useful when the receiver is in a location where it is difficult for the satellite signals to penetrate. In addition to providing better coverage, A-GPS also improves the start-up time, which is the time required by the satellites and the receivers to establish a reliable connection.

4.16 Dilution of Precision (DOP) — DOP is the degree of proximity of the location data to their mean value. The relative position of satellites affects the accuracy of location calculation by the locating module. Location coordinates computed when the satellites are clustered together suffer from dilution of precision (DOP), a factor that multiplies the associated errors. The DOP for an ideal satellites constellation arrangement equals close to 1, which does not magnify the underlying errors.

4.17 Global Navigation Satellite System (GNSS) — A space-based radio navigation system. It provides positioning, navigation, and timing services to military and civilian users on a continuous basis.

4.18 SIM/UICC — Subscriber Identification Module (SIM)/ Universal integrated circuit card (UICC/eUICC) as per GSMA guidelines / DoT(TEC) Guidelines. Embedded SIM/UICC is a PCB soldered SIM /UICC/eUICC.

4.19 Cellular Technology such as GPRS/UMTS/HSPA/LTE, etc. GPRS word used in the document shall mean 'Cellular technology'.

4.20 Distance Root Mean Square (DRMS also called RMS, 1Sigma) — This is computed as square root of the average of the squared horizontal position errors with 65 percent probability. The position expressed has the probability of being within a circle with radius with 65 percent probability. A locating module with 6 m DRMS accuracy would be within 6 m of its actual position 65 percent of the time.

2DRMS shall mean 2 Sigma or simply speaking twice the RMS. 2DRMS of the position expressed has the probability of being within a circle with radius with 95 percent probability. A locating module with 6 m 2DRMS accuracy would be within 6 m of its actual position 95 percent of the time.

4.21 Global Positioning System (GPS) — It is a space-based radio navigation system. It provides positioning, navigation, and timing services to military and civilian users on a continuous basis.

4.22 Automotive Tracking Device (ATD) / Vehicle Location Tracking (VLT) — Devices that use satellite based location technology to determine and record the precise location of a vehicle at regular intervals. The location data so determined can be stored within the device, and/or can be transmitted to the Backend Control Centre using a wireless communication modem built in the device.'

[*Page*3, *clause***A-2.1** (1)]— Substitute the following for the existing:

'The system should support any operational GNSS system (Location, speed, heading, time stamp) data polling and capable of sending this data at a frequency shall be 5 s during vehicle operation and not less than 10 min. Device shall be capable for operating in L and/or S band and include support for NAVIC/IRNSS (Indian Regional Navigation Satellite System) for devices installed on vehicles on or after 1st April 2019. However ATD devices shall be compliant as per other GNSS constellation in the interim period.'

[*Page* 3, *clause* **A-2.1** (5)] — Substitute the following for the existing:

'The system's GNSS module shall have an acquisition equal to or better than (-) 145 dBm with GNSS/ 140 dBm with IRNSS (NAVIC as applicable.).'

Price Group 7

[*Page* 3, *clause* **A-2.1** (6)] — Substitute the following for the existing:

'The system's GNSS module shall have a tracking sensitivity equal to or better than (-) 160 dBm with GNSS / 153 dBm with IRNSS (NAVIC as applicable).'

[*Page* 3, *clause***A-2.1** (8)] — Substitute the following for the existing:

'The system's GNSS module should have:
a) The capability of hot start < 10s
b) The capability of warm start < 60s
c) The capability of cold start < 120s'

[*Page* 3, *clause* **A-2.1** (9)] — Substitute the following for the existing:

'Should support standard digital I/O: 4 Digital, 2 Analogue Input and 1 Serial Communication) for interfacing external systems (E.g. Digital input for Emergency request button interfacing) and output for triggering other devices like hooter/flash light, etc.'

[*Page* 3, *clause* **A-2.1** (10)]— Substitute the following for the existing:

'In case of use on Buses it will provide additional information:
a) Provide GPS data via RS 232/Ethernet to other On –Bus Devices (Such as PIS, CCTV system, Ticketing system, etc).
b) Receive Route Number information from other On-Board devices and transmit to back end. (Optional).
c) Provide CAN interface to send relevant Vehicle Health data to Back end (Optional).
d) Provision to provide Alerts Data/ VHMD to Other On-Bus devices (optional).
e) Provide Cellular module data transfer gateway to other on-bus devices (Optional).'

[*Page* 4, *clause* **A-2.1** (12)] — Substitute the following for the existing:

'System shall have an internal back-up battery to support 4 h of normal operation (To be tested for positional record transmission at a frequency of 60 s).'

[*Page* 4, *clause* **A-2.1** (13)] — Substitute the following for the existing:

'The system's Cellular module should have:
a) Multi slot GPRS with In - Built Quad-band GPRS module/Modem.
b) GPRS class 10 or above.
c) Support Embedded SIM/UICC (As per as per GSMA guidelines / DoT (TEC) Guidelines) to cater to the automotive operational requirement such as vibration, temperature and humidity and provide long life span with at least 10 years life and more than 1 million read/write cycles.
d) GPRS module and SIM:
i) Shall support SMS, Data (GPRS, TCP/IP), and
ii) Support multiple network OTA switching (on-demand/ automatic) capabilities.'

[*Page* 4, *clause* **A-2.1** (14)] — Substitute the following for the existing:

'Device shall be manufactured by manufacturer whose quality management system has been certified for compliance to ISO / TS 16949 or ISO 9001 or any equivalent National Standard.'

[*Page* 4, *clause* **A-2.1** (15)] — Substitute the following for the existing:

'Device shall have an internal antenna. However, in case of integrated systems with vehicle OEM fitted kits, if the fitment location prevents the internal antenna from functioning, then additional external antenna may be provided.'

[*Page* 4, *clause* **A-2.1** (16)] — Delete.

[*Page* 4, *clause* **A-2.1** (24)] — Substitute the following for the existing:

'Device shall be capable of transmitting Position, Velocity and Time (PVT data) along with heading (direction of travel) to a Backend Control Server (Government authorized server) *via* Wide Area (Mobile) Communications network (Cellular) at configurable frequency as per Communication Protocol in **A-4**. The fixed frequency shall be user configurable. Highest data transmission rate shall be 5 s during vehicle operation and not less than 10 min in sleep/IGN OFF) as per the protocol defined in Communication Protocol of **A-4**.'

(*Page* 4, *clause***A-2.2**)— Substitute the following for the existing clause:

'The device below parameters should be configurable over the air (through SMS or Cellular). The updation shall be allowed only over an 'authenticated' channel:

a) Setting/ Change of the Primary or Secondary IP and port number.
b) Setting/Change of the APN.
c) Set configuration parameter like sleep time, over speed limit, harsh braking, harsh acceleration, rash turning threshold limits etc.
d) Emergency control and Activation/ Health Check control SMS Centre Number(s).
e) Configuring the Vehicle registration number.
f) Configuring the frequency of data transmission in normal / Ignition state / 'OFF' state sleep mode/ health check message on SMS / Emergency state, etc.
g) Command to get the IMEI (International Mobile Station Equipment Identity)/ Health Status of the device.
h) CLR: For clearing certain commands, alarms, alerts, etc, except emergency alert.

After each SET, GET, CLR command the device should send alert to Backend Control Centre, as mentioned in **A-4** Alert (xii), giving the details of Mode, mobile no/ IP of control centre sending commands.'

(*Page* 5, *clause* **A-2.3**) — Insert the following at the end of the clause:

'**A-2.4 Device to Backend Communication Mechanism**

The VLT device would transmit data to the Backend Control Centre using Cellular wireless connectivity (with SMS fall back) as per the protocol provided in respective sections (*see***A-7.4**). The data from the devices would travel over the wireless telecom service provider network and finally get delivered at the Backend Control Centre. Since the permit holders/Device suppliers would require to have a valid communication plan on SIM cards on the devices and would avail services from multiple telecom service providers, the data would be transmitted to the Backend Control Centre using the networks of multiple telecom service providers. The Communication from Device to backend should happen on a Secure channel over TCPIP protocol preferably on socket based connections where sessions are managed to send commands over the same connection to the device and are authenticated, identifiable, so as to prevent spoofing on IMEI/ Unique ID.

A suitable control mechanism would be established for the data transfer from VLT to Backend Control Centre, as only the authorized devices should be able to transfer data to the Backend Control Centre and a mechanism for authenticating the devices/SIMs/UICC shall also be put into place.

The following mandatory provisions will have to be made in the Backend Control Centre:
1. Registration and activation of the device(s) fitted on the vehicle, including the details of vehicle registration number, engine number, chassis number, vehicle make and model, device make and model, and telecom service provider's name.
2. Re-registration/re-activation of the device(s) fitted on the vehicle in case of any change in device or telecom service provider, etc.
3. Regular health check of the device(s) fitted on the vehicle, as per the parameters and frequency defined in **A-7.4**.
4. Administration/configuration of devices for any changes in the parameters as decided by the respective state from time to time.
5. Notification of alerts in case of press of an Alert Button fitted on the vehicle, in the protocol defined in **A-4**.
6. Notification of alerts in case of defined deviations by vehicle such as over-speeding, deviation from defined route/geographic area, time of operation, etc.

7. Location tracking of the vehicle including real-time as well as history tracking for up to last 90 days.
8. Notification to the permit-holder through SMS in case any device(s) stops functioning/sending data to the Backend Control Centre.
9. Reports of the vehicles with devices not working/sending data beyond defined number of days (1 day, 3 days, 7 days and 30 days).
10. Ensure that the security and privacy of the data is maintained in accordance with applicable laws/guidelines of various government authorities.

In addition to the above mandatory provisions, the Backend Control Centre can provide any other optional features. The mechanism to set up the Backend Control Centre shall be decided by the respective states.'

(*Page* 5, *clause* **A-3**) — Substitute the following for the existing matter:

'a) Passengers or in-vehicle crew present in the vehicle shall be able to make an emergency request by pressing the emergency button provided.
b) The emergency request function shall not exist as standalone. The function shall be part of Automatic Vehicle Location Tracking (VLT) system. An alert shall be send to the Backend Control Server when emergency request is raised. De-activation shall always be from authorized government server who receives alert message i.e. as mentioned in **A-4.2.2**.
c) The Emergency Buttons will be such that disconnection between switch and controller should be detected through controller logic or 'Normally Closed' (NC) Type Switch. For Emergency button, there shall be indication of its working status visible for passengers in Ignition ON Condition. The form factor of Emergency Buttons will be such that the button is easy to press in the case of an emergency, and simultaneously also minimizes the possibility of accidental or unintended press thereby causing a false alert.
d) On pressing of Emergency button, the system implementing VLT function shall send emergency Alert to the configured IP addresses as per the communication protocol mentioned below. In the absence of Cellular network, the alert shall be send as SMS message along with vehicle location data to configured control centre number(s). The SMS shall consist of parameters as given in **A-4.2.2.**'

(*Page* 5, *clause* **A-4.2**) — Substitute:

'In case of emergency Alert, the alert message should be sent to dual IP addresses hence the device should support minimum 2 IP addresses simultaneously [1 IP address for regulatory purpose (PVT data) and 1 IP address for Emergency response system other than the IP's required for Operational purpose]. The PVT data will send the emergency alert to the system. Primary alert will go to the Emergency Response backend control centre (NERS/ MHA) as may be notified by the Government of India in the schema below:' *for* 'In case of emergency Alert, the alert message should be sent to dual IP addresses hence the device should support minimum two IP addresses simultaneously. Primary alert will go to the Emergency Response backend (NERS/MHA) as may be notified by the Government of India in the schema below:'

[*Page* 6, *Table* 1, *Sl No*. v), xxxiv) and xxxviii)] — Substitute the following for the existing:

Sl No. (1)	**Field** (2)	**Description** (3)	**Sample Data** (4)
v)	Packet Type	Specify the packet type — NR = Normal EA = Emergency Alert TA = Tamper Alert HP = Health Packet IN = Ignition On IF = Ignition Off BD = Vehicle Battery Disconnect BR = Vehicle Battery Reconnect BL = Internal Battery Low	Depending upon the context, every frame from tracking device must carry a qualification code. This helps to determine the state in which vehicle is at that time.
xxxiv)	NMR (Network Measurement Report) (neighbouring Cell ID)	Neighbouring 4 cell ID along with their LAC & signal strength	—
xxxviii)	Checksum	Ensures No error in transmission (optimal)	16

[*Page* 7, *Table* 2, *Sl No.* ii), vii), viii), ix), x) and xii)] — Substitute the following for the existing:

Sl No. (1)	**Message** (2)	**Remarks** (3)
ii)	Location Update (history)	Would be sent, if Cellular is not available at the time of sending the message in protocol format Zero, BLANK, NIL, etc.
vii)	Alert – Ignition ‘ON’	Indicates that Vehicle has started (ignition ‘ON’)
viii)	Alert – Ignition ‘OFF’	Indicates that Vehicle’s Ignition is switched ‘OFF’
ix)	Alert – GPS box opened (optional)	Optional Message would be generated indicating GPS box opened
x)	Alert – Emergency state ‘ON’	When any of the emergency button is pressed
xii)	Alert Over the air parameter change	When any parameter changed over the air/manually. Shall include the name of parameter changed and source of command

(*Page* 7, *Table* 2) — Insert the following at the end of the table:

Sl No. (1)	**Message** (2)	**Remarks** (3)
xvi)	Device Tampered	Alert Indicating Emergency button wire disconnect/ wire cut etc.

(*Page* 8, *clause* **A-4.2**) — Substitute:

‘Only Primary alert data will go to the Emergency Response backend system as notified by the Government of India in the indicative format given in the table below:’ *for* ‘Primary alert will go to the Emergency Response backend system as notified by the Government of India in the indicative format given in the table below:’

(*Page* 8, *clause* **A-4.2.2**) — Insert the following at the end of the clause:

‘**A-4.2.3 Activation SMS Format from State Backend/ Common Layer to Device**

SMS (To the VLT Device Mobiles Number) = ACTV, Random Code, Reply SMS Gateway no.
Activation Message Reply Format from Device to State Backend/ Common Layer(Thru SMS)
ACTVR + Random Code +Vendor ID + Firmware Version + IMEI +Alert ID+ GPS Fix + No of Satellites + Date + Time + Latitude + Latitude Dir + Longitude + Longitude Dir +Speed + Heading + Altitude + PDOP + HDOP +Network Operator Name + GSM Signal Strength + Mobile Country Code + Mobile Network Code (MNC) + Location Area Code (LAC) + Cell ID + NMR +Ignition + Frame Number + Vehicle Mode
Health Check Random Messages from State Backend/ Common Layer to Device
Frequency: Twice Daily (Recommended)
SMS(To the VLT Device Mobiles Number) = HCHK, Random Generated ID, Reply SMS Gateway no.
Health Check Message Reply Format from Device to State Backend/ Common Layer(Thru SMS)
HCHKR + Random Generated ID +Vendor ID + Firmware Version + IMEI +Alert ID+ GPS Fix + No of Satellites + Date + Time + Latitude + Latitude Dir + Longitude + Longitude Dir +Speed + Heading + Altitude + PDOP + HDOP +Network Operator Name + GSM Signal Strength + Mobile Country Code + Mobile Network Code (MNC) + Location Area Code (LAC) + Cell ID + NMR +Ignition + Frame Number + Vehicle Mode.’

(*Page* 9, *clause* **A-5.2**) — Substitute the following for the existing matter:

‘Vehicle power interface shall have,
a) one common ground linked to vehicle chassis.
b) one permanent power Supply (12/24V) connected to the Vehicle battery.
c) one non-permanent power line (12/24V) connect to the battery after Ignition.

The vehicle tracking device will be installed on vehicles in which the power supply voltage from vehicle battery is widely varying (12V, 24V etc.) and also the power supply is not as stable as that in case of fixed locations, especially during engine start-up and braking when the voltage can fall to as low as 9V. Typically electronic devices are very sensitive to power surges and spikes, and equipment may fail if they do not receive stable power supply. The devices will need to have a resilient power supply unit that can withstand such fluctuations and the devices also need to have power backup so that they continue to function for some duration when the vehicle battery is not functional or is disconnected from the devices.'

(*Page* 9, *clause* **A-5.4**) — Substitute the following for the existing:

'The number of emergency buttons and their positioning in different types of vehicles shall be based on the length, seating and interior layout of the vehicle. One emergency button shall be installed within easy reach of the driver. Other emergency buttons shall be installed in the vehicle on both sides, in such a way that they are within easy reach of the passengers.'

(*Page* 9, *clause* **A-6**) — Substitute the following for the existing:

'a) The tests have been classified as Type Tests and Acceptance Tests.
b) The tests have been divided into categories.
The devices can be tested and certified from the testing agencies referred to in rule 126 of the CMVR for compliance to the rule 125 H of CMVR.'

[*Page* 9, *clause* **A-6.1** (a)] — Substitute the following for the existing matter:

'1) Tracking Functionality Test [*see* **A-7.1** (a)].
2) Location Accuracy Test [*see* **A-7.1** (b)].
3) Cold-Start Time to First Fix (TTFF) Test [*see* **A-7.1** (c)].
4) Warm-Start Time to First Fix Test [*see* **A-7.1** (d)].
5) Hot-Start Time to First Fix Test [*see* **A-7.1** (e)].
6) Acquisition Sensitivity Test [*see* **A-7.1** (f)].
7) Tracking Sensitivity Test [*see* **A-7.1** (g)].
8) Functional Endurance Test [*see* **A-7.1** (h)].
9) On Vehicle Dynamic Location Test [*see* **A-7.1** (j)].
10)SIM Testing [*see* **A-7.1** (k)].'

(*Page* 9, *clause* **A-6.2**) — Substitute the following for the existing:

The following shall constitute acceptance tests:
'a) Tracking Functionality Test [*see* **A-7.1** (a)].
b) Location Accuracy Test [*see* **A-7.1** (b)].
c) Cold-Start Time to First Fix (TTFF) Test [*see* **A-7.1** (c)].
d) Warm-Start Time to First Fix Test [*see* **A-7.1** (d)].
e) Hot-Start Time to First Fix Test [*see* **A-7.1** (e)].
f) Acquisition Sensitivity Test [*see* **A-7.1** (f)].
g) Tracking Sensitivity Test [*see* **A-7.1** (g)].
h) Functional Endurance Test [*see* **A-7.1** (h)].
j) On Vehicle Dynamic Location Test [*see* **A-7.1** (j)].
k)SIM Testing [*see* **A-7.1** (k)].
m) Protocol testing (*see* **A-7.4**).'

(*Page* 10, *clause* **A-7.1**) — Substitute the following for the existing matter:

'Functional testing will be carried out to assess the performance of the tracking device on important functional aspects as given below. The functional tests(a) to (k) mentioned below may be done either inside the test lab using a GPS simulator or outside the lab by other methods as decided by the authorized test agency:
a) *Tracking functionality test*—The test shall be conducted on VTL to determine the proper functioning of VLT with Emergency Button by testing its connectivity to Backend Control Centre (Government authorized server). Procedure: The VLT with Emergency Button shall be connected to vehicle battery to switch it on. The VLT

with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages.

b) *Location accuracy test*—This test shall be conducted on VLT with Emergency Button. The receiver is placed into a cold start state, usually by a command sent to the receiver through a test connection, and then a fairly strong navigation signal simulating in L and/or S band is sent. The time it takes for the receiver to determine its first good location fix is recorded. Test is done many times (>15 times) over many conditions and the results are averaged Acceptance Criteria: 2.5 m CEP or 6m 2DRMS

c) *Cold-start time to first fix (TTFF) test*—This test is used to determine the time taken for first fix during a cold start of the device. The device in this test is placed into a cold start state. The time it takes for the device to determine its first good location fix is recorded. The cold start test is performed several times and the results are averaged.

Acceptance Criteria: The cold start TTFF shall be less than 120 s at Open Sky condition or (-) 130 dBm.

d) *Warm-start time to first fix test*—This test is used to determine the time taken for first fix during a warm start of the device. In this test the device is started in warm start mode and time taken by device to determine the first valid location fix is recorded. This is done several times and results are averaged.

Acceptance Criteria: The warm start TTFF should be less than 60 s at (-) 130 dBm

e) *Hot-start time to first fix test*— This test is used to determine the time taken for first fix during a hot start of the device. In this test the device is started in hot start mode and time taken by device to determine the first valid location fix is recorded. This test is performed several times and results are averaged.

Acceptance Criteria: The hot start TTFF should be less than 10 s.

f) *Acquisition sensitivity test*—Acquisition sensitivity refers to the minimum signal level at which the device is able to successfully perform a cold start TTFF. The acquisition sensitivity test is a simulated signal test. A device cold start is performed, and the time to acquisition is measured. Signal levels are then progressively decreased until the device can no longer acquire the location. This signal strength is recorded.

Acceptance Criteria: The acquisition sensitivity shall be minimum (-) 145 dBm with GNSS/ 140 dBm with IRNSS (NAVIC as applicable.).

g) *Tracking sensitivity test*— Tracking sensitivity refers to the minimum signal level at which the device is able to successfully maintain the location fix. The acquisition sensitivity test is a simulated signal test. Test setup for the tracking sensitivity receiver test is as shown in Fig. 3. The device under this test is locked on to the simulator's output frequency and the simulator power output is lowered until the lock is lost. Multiple repetition of the test with different satellite geometries ensures that an accurate average measure is recorded.

Acceptance Criteria: The tracking sensitivity shall be equal to or better than (-) 160 dBm with GNSS / 153 dBm with IRNSS (NAVIC as applicable).

h) *Functional endurance test*—VLT device shall be operated for 96 h with external power supply and internal battery connected to device. PVT data monitoring will be done for complete duration of test with data frequency defined after IGN switch 'ON' mode. VLT device shall function successfully during and after test.

j) *On vehicle dynamic location test*— VLT devices will be mounted on any target vehicle connected with vehicle battery. Target vehicle with VLT devices will be run for 10 km on pre-defined track/route to verify dynamic location test. VLT device PVT data shall be within ± 6.0 m for more than 90 percent of the fixed location data.

k) *SIM testing* —This test is to check the suitability of the SIM and communication module. The test shall be conducted to determine the effectiveness and operation of the GPRS module with OTA network switching capabilities on demand as well as automatically in real-time. The device would be tested to perform as per the protocol (**A-7.4**) using an embedded SIM/UICC. The GPRS module and SIM, shall support SMS and Data (GPRS, TCP/IP)

Acceptance Criteria: In the testing, vendors has to demonstrate the embedded SIM/UICC based tracking and multiple network OTA switching capabilities (On Demand as well as Automatic Switching on real-time basis) for effective network management and transmission.'

[*Page* 13, *clause* **A-7.2** (a)] — Insert the following at the end:

24V System	12V System
18V, -25°C	9V, -25°C
18V, +80°C	9V, +80°C
18V, Room Temperature	9V, Room Temperature
27V, -25°C	13.5V, -25°C
27V, +80°C	13.5V, +80°C
27V, Room Temperature	13.5 V, Room Temperature
32V, -25°C	16V, -25°C
32V, +80°C	16V, +80°C
32V, Room Temperature	16V, Room Temperature

[*Page* 13, *clause* **A-7.2** (a), *line* 16] — Substitute ‘tracking functionality’ *for* ‘functional’

[*Page*13, *clause* **A-7.2** (b)] — Substitute the following for the existing:

‘*Shock test* —Shock test is performed to provide a degree of confidence that the device can physically and functionally withstand the relatively infrequent, non-repetitive shocks encountered in transportation environments. This test provides an assessment of the effect of the shocks on the performance of the device. The test shall be performed as per IS 9000 (Part 7). Severity Level = 15g, Impact duration = 11ms, Impact Type = Half sine, Total number of impact = 9 (3 on each axis).
Acceptance Criteria: Device after the shock test shall be required to meet the provisions of Tracking Functional Test.’

[*Page* 13, *clause* **A-7.2** (c), *line* 18] — Substitute ‘tracking functionality’ *for* ‘functional’.

[*Page* 13, *clause* **A-7.2** (e), *line* 11] — Substitute ‘Device after the over voltage protection test shall meet the requirements of Tracking functionality test’ *for* ‘Device after the vibration test shall meet the requirements of functional tests’.

[*Page* 13, *clause* **A-7.2** (g), *line* 11] — Substitute ‘tracking functionality’ *for* ‘functional’.

[*Page* 14, *clause* **A-7.2** (j), *line* 7] — Substitute ‘tracking functionality’ *for* ‘functional’.

[*Page* 14, *clause* **A-7.2** (k)] — Substitute the following for the existing:

‘*Flammability test* — The wiring harness used in the device should be tested for flammability as per IS 2465. Electrical Properties: The wiring harness used in the device should be tested for electrical properties as per AIS 028 or DIN72551 or ISO 6722.’

[*Page* 14, *clause* **A-7.2** (m), *line* 5] — Substitute ‘tracking functionality’ *for* ‘functional’.

[*Page* 14, *clause* **A-7.3** (a), *line* 12]— Substitute ‘tracking functionality’ *for* ‘functional’.

[*Page* 14, *clause* **A-7.3** (b)] — Substitute ‘tracking functionality’ *for* ‘functional’.

[*Page* 14, *clause* **A-7.3** (c)] — Substitute ‘tracking functionality’ *for* ‘functional’.

[*Page* 14, *clause* **A-7.3** (e)] — Substitute ‘tracking functionality’ *for* ‘functional’.

[*Page* 14, *clause* **A-7.3** (a), (b), (c) and (e)] — Insert the following at the end:

Device should be free from any kind of deformation, cracks, damage, etc.’.

[*Page* 14, *clause* **A-7.3** (f)] — Substitute 'Device after the test shall meet the requirements of tracking functionality tests. Device should be free from any kind of corrosion' *for* 'Device after the test shall meet the requirements of functional tests'.

[*Page* 14, *clause* **A-7.3** (g)] — Substitute 'tracking functionality' *for* 'functional'.

[*Page* 15, *Table* 4, *Sl No*. iv)] — Substitute the following for the existing:

Sl No. (1)	**Field** (2)	**Description** (3)
iv)	Packet Type	Specify the packet type – NR = Normal EA = Emergency Alert TA = Tamper Alert HP = Health Packet IN = Ignition On IF = Ignition Off BD = Vehicle Battery Disconnect BR = Vehicle Battery Reconnect BL = Internal Battery Low

[*Page* 16, *Table* 5, *Sl No.* vii) and viii)] — Substitute the following for the existing:

Sl No. (1)	**Message** (2)	**Remarks** (3)
vii)	Alert – Ignition ON	Indicates that vehicle ignition is switched 'ON'
viii	Alert – Ignition OFF	Indicates that vehicle ignition is switched 'OFF'

[*Page* 17, *Table* 6, *Sl No.* xii) and xvi)] — Substitute the following for the existing:

Sl No. (1)	**Attribute** (2)	**Value / Description** (3)	**Size** (4)
xii)	Speed	Speed of vehicle as calculated by GPS module in VLT. (in km/hrs.)	Float, 6 bytes
xvi)	Reply Number	The mobile number to whichTest response need to be sent. (Emergency Mobile No. as specified by MHA/ MoRTH/States.)	0

[*Page* 18, *clause* **B-2.1** (13)] — Delete.

[*Page* 18, *clause* **B-2.1** (15)] — Delete.

[*Page* 19, *clause* **B-2.1** (24)] — Substitute the following for the existing:

'System shall have a Fare Meter complying with IS 2747'

[*Page* 20, *clause* **B-2.4**, *Sl No.* xiii), and xiv)] — Substitute the following for the existing:

Sl No. (1)	**Field** (2)	**Description** (3)
xiii)	EFM LCD display working	LCD Display health Status
xiv)	Printer working	Printer Connected/Not Connected

[*Page* 21, *Table* 7, *Sl No.* xxxix), xl) *and* xli)] — Substitute the following for the existing:

Sl No. (1)	**Field** (2)	**Description** (3)	**Sample Data** (4)
xxxix)	Trip ID	Unique ID for each trip	353301056510030-10/03/2014-10:12:04 AM
xl)	Trip duration	Duration of Trip in format as HHMMSS	123417
xli)	Waiting time	Duration of Idle time format as HHMMSS	123417

(*Page* 22, *Table* 8) — Insert the following at the beginning of the table:

Sl No. (1)	**Message** (2)	**Remarks** (3)
0)	Start character	$

[*Page* 22, *Table* 8, *Sl No.* xv)] — Insert the following at the end of xv):

Sl No. (1)	**Message** (2)	**Remarks** (3)
xvi)	Harsh braking	Alert indicating for harsh braking.
xvii)	Harsh acceleration	Alert indicating for harsh acceleration.
xviii)	Rash turning	Alert indicating for Rash turning.
xix)	Device tempered	Alert Indicating Emergency button wire disconnect/ wire cut etc.
xx)	End character	*

(*Page* 24, *clause* **5.4**) — Substitute the following for the existing matter:

'The number of emergency buttons and their positioning in different types of vehicles shall be based on the length, seating and interior layout of the vehicle. One emergency button shall be installed within easy reach of the driver. Other emergency buttons shall be installed in the vehicle on both sides, in such a way that they are within easy reach of the passengers.'

[*Page* 24, *clause* **B-6.1** (a)] — Substitute the following for the existing matter:

'Functional testing:
1) Tracking Functionality Test [*see* **B-7.1**(a)]
2) Location Accuracy Test [*see* **B-7.1**(b)]
3) Cold-Start Time to First Fix (TTFF) Test [*see* **B-7.1**(c)]
4) Warm-Start Time to First Fix Test [*see* **B-7.1**(d)]
5) Hot-Start Time to First Fix Test [*see* **B-7.1**(e)]
6) Acquisition Sensitivity Test [*see* **B-7.1**(f)]

7) Tracking Sensitivity Test [*see* **B-7.1**(g)]
8)Functional Endurance [*see* **A-7.1**(h)]
9) On Vehicle Dynamic Location Test [*see* **A-7.1**(j)]
10) SIM Testing [*see* **A-7.1**(k)]'

[*Page* 24, *clause* **B-6.2**, *Sl No.*(g)] — Substitute 'Functional endurance test' *for* 'Interference testing'.

[*Page* 24, *clause* **B-6.2**, *Sl No.*(h)] — Substitute 'On vehicle dynamic location test' *for* 'Multipath testing'.

[*Page* 25, *Table* 9, *Sl No.*vii)] — Substitute 'Functional endurance test' *for* 'Interference testing'.

[*Page* 25, *Table* 9, *Sl No.* viii)] — Substitute 'On vehicle dynamic location test' *for* 'Multipath testing'.

(*Page* 25, *clause* **B-7.1**) — Substitute the following for the existing:

'7.1 Functional Testing

Functional testing will be carried out to assess the performance of the tracking device on important functional aspects as below. The tests mentioned below may be done either inside the test lab using a GPS simulator or outside the lab by other methods as decided by the authorized test agency:
a) *Tracking functionality test* — The test shall be conducted on VTL to determine the proper functioning of VLT with Emergency Button by testing its connectivity to Backend Control Centre (Government authorized server). Procedure: The VLT with Emergency Button shall be connected to vehicle battery to switch it on. The VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages.
b) *Location accuracy test*—This test shall be conducted on VLT with Emergency Button. The receiver is placed into a cold start state –usually by a command sent to the receiver through a test connection – and then a fairly strong navigation signal simulating in L and/or S band is sent. The time it takes for the receiver to determine its first good location fix is recorded. Test is done many times (>15 times) over many conditions and the results are averaged Acceptance Criteria: 2.5 m CEP or 6m 2DRMS
c) *Cold-start time to first fix (TTFF) test* — This test is used to determine the time taken for first fix during a cold start of the device. The device in this test is placed into a cold start state. The time it takes for the device to determine its first good location fix is recorded. The cold start test is performed several times and the results are averaged.
Acceptance Criteria: The cold start TTFF shall be less than 120 s at Open Sky condition or (-) 130 dBm.
d)*Warm-start time to first fix test*— This test is used to determine the time taken for first fix during a warm start of the device. In this test the device is started in warm start mode and time taken by device to determine the first valid location fix is recorded. This is done several times and results are averaged.
Acceptance Criteria: The warm start TTFF should be less than 60 s at (-) 130 dBm
e)*Hot-start time to first fix test*— This test is used to determine the time taken for first fix during a hot start of the device. In this test the device is started in hot start mode and time taken by device to determine the first valid location fix is recorded. This test is performed several times and results are averaged.
Acceptance Criteria: The hot start TTFF should be less than 10 seconds.
f) *Acquisition sensitivity test*— Acquisition sensitivity refers to the minimum signal level at which the device is able to successfully perform a cold start TTFF. The acquisition sensitivity test is a simulated signal test. A device cold start is performed, and the time to acquisition is measured. Signal levels are
Acceptance Criteria: The acquisition sensitivity shall be minimum (-) 145 dBm with GNSS/ 140 dBm with IRNSS (NAVIC as applicable.).
g)*Tracking sensitivity test*— Tracking sensitivity refers to the minimum signal level at which the device is able to successfully maintain the location fix. The acquisition sensitivity test is a simulated signal test. Test setup for the tracking sensitivity receiver test is as shown in Fig. 7. The device under this test is locked on to the simulator's output frequency and the simulator power output is lowered until the lock is lost. Multiple repetition of the test with different satellite geometries ensures that an accurate average measure is recorded.
Acceptance Criteria: The tracking sensitivity shall be equal to or better than (-) 160 dBm with GNSS / 153 dBm with IRNSS (NAVIC as applicable).
h) *Functional endurance test* —VLT device shall be operated for 96 h with external power supply and internal battery connected to device. PVT data monitoring will be done for complete duration of test with data frequency defined after IGN switch ON mode. VLT device shall function successfully during and after test.

j) *On vehicle dynamic location test*— VLT devices will be mounted on any target vehicle connected with vehicle battery. Target vehicle with VLT devices will be run for 10 km on pre-defined track/route to verify dynamic location test. VLT device PVT data shall be within ± 6.0 m for more than 90 percent of the fixed location data.
k)*Sim testing*—This test is to check the suitability of the SIM and communication module. The test shall be conducted to determine the effectiveness and operation of the GPRS module with OTA network switching capabilities on demand as well as automatically in real-time. The device would be tested to perform as per the protocol (*see***B-7.4**) using an embedded SIM/UICC. The GPRS module and SIM, shall support SMS and Data (GPRS, TCP/IP).
Acceptance Criteria: In the testing, vendors has to demonstrate the embedded SIM/UICC based tracking and multiple network OTA switching capabilities (On Demand as well as Automatic Switching on real-time basis) for effective network management and transmission.'

[*Page* 29, *clause* **B-7.3**, *Sl No.* f)] — Substitute the following for the existing:

'*Salt Spray Test*— The salt spray test is conducted to check corrosion resistance of device. The device should be tested according to **4.8** of IS 10250 for 96 h. Printer slip enclosures (which are supposed to be closed during test) should be sealed properly during testing to avoid any salt water ingress.
Acceptance Criteria: Device after the test shall meet the requirements of tracking functionality test. Device should be free from any type of corrosion.'

(*Page* 29, *clause* **B-7.3**) — Substitute 'Cellular Technology' *for* GPRS/GPRS technology

(*Page* 34, *clause* **C-5.3**, *Sl No.*5) — Substitute the following for the existing:

'The IP camera shall support H.264 or H.265 or latter video compression algorithm.'

(*Page* 48, *clause* **C-13.2**)— Substitute the following for the existing:

'**C-13.2** The number of emergency buttons and their positioning in different types of vehicles will be based on the length, seating and interior layout of the vehicles. One Emergency button will be installed within easy reach of the driver. Other emergency buttons will be installed in the vehicle on both sides, in such a way that they are within easy reach of the passengers such as every 2 m on both the sides of passenger seating area. In case of passenger transport bus which has a glass window covered between two pillars having pitch 2m or more, the emergency buttons shall be provided on each pillar.'

(*Page* 52, *clause* **D-2.4**, *Sl No.* 5) — Substitute the following for the existing:

'The IP camera shall support H.264 or H.265 or latter video compression algorithm.'

(*Page* 69, *clause* **D-9.1**) — Substitute the following for the existing:

'In addition to the testing specified in Annex C, the following testing will be carried out for mDVR and mNVR with respect to vehicle tracking related features. The functional tests (a) to (k) mentioned below may be done either inside the test lab using a GPS simulator or outside the lab by other methods as decided by the authorized test agency:

a) Tracking Functionality Test,
b) Location Accuracy Test,
c) Cold-Start Time to First Fix (TTFF) Test,
d) Warm-Start Time to First Fix Test,
e) Hot-Start Time to First Fix Test,
f) Acquisition Sensitivity Test,
g) Tracking Sensitivity Test,
h) Functional Endurance Test,
j) On Vehicle Dynamic Location Test, and
k) SIM Testing'

(*Page* 69, *clause* **D-9.1.1**) — Substitute the following for the existing:

‘Functional testing will be carried out to assess the performance of the tracking device on important functional aspects as below:

a) *Tracking functionality test* —The test shall be conducted on VTL to determine the proper functioning of VLT with Emergency Button by testing its connectivity to Backend Control Centre (Government authorized server). Procedure: The VLT with Emergency Button shall be connected to vehicle battery to switch it on. The VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages.

b) *Location accuracy test*—This test shall be conducted on VLT with Emergency Button. The receiver is placed into a cold start state –usually by a command sent to the receiver through a test connection – and then a fairly strong navigation signal simulating in L and/or S band is sent. The time it takes for the receiver to determine its first good location fix is recorded. Test is done many times (>15 times) over many conditions and the results are averaged

Acceptance Criteria: 2.5 m CEP or 6m 2DRMS

c) *Cold-start time to first fix (TTFF) test*—This test is used to determine the time taken for first fix during a cold start of the device. The device in this test is placed into a cold start state. The time it takes for the device to determine its first good location fix is recorded. The cold start test is performed several times and the results are averaged.

Acceptance Criteria: The cold start TTFF shall be less than 120 s at Open Sky condition or (-) 130 dBm.

d) *Warm-start time to first fix test*—This test is used to determine the time taken for first fix during a warm start of the device. In this test the device is started in warm start mode and time taken by device to determine the first valid location fix is recorded. This is done several times and results are averaged.

Acceptance Criteria: The warm start TTFF should be less than 60 s at (-) 130 dBm

e) *Hot-start time to first fix test*—This test is used to determine the time taken for first fix during a hot start of the device. In this test the device is started in hot start mode and time taken by device to determine the first valid location fix is recorded. This test is performed several times and results are averaged.

Acceptance Criteria: The hot start TTFF should be less than 10 s.

f) *Acquisition sensitivity test*—Acquisition sensitivity refers to the minimum signal level at which the device is able to successfully perform a cold start TTFF. The acquisition sensitivity test is a simulated signal test. A device cold start is performed, and the time to acquisition is measured. Signal levels are then progressively decreased until the device can no longer acquire the location. This signal strength is recorded.

Acceptance Criteria: The acquisition sensitivity shall be minimum (-) 145 dBm with GNSS/ 140 dBm with IRNSS (NAVIC as applicable.).

g) *Tracking sensitivity test*—Tracking sensitivity refers to the minimum signal level at which the device is able to successfully maintain the location fix. The acquisition sensitivity test is a simulated signal test. Test setup for the tracking sensitivity receiver test is as shown in Fig. 14. The device under this test is locked on to the simulator’s output frequency and the simulator power output is lowered until the lock is lost. Multiple repetition of the test with different satellite geometries ensures that an accurate average measure is recorded.

Acceptance Criteria: The tracking sensitivity shall be equal to or better than (-) 160 dBm with GNSS / 153 dBm with IRNSS (NAVIC as applicable).

h) *Functional endurance test*— VLT device shall be operated for 96 h with external power supply and internal battery connected to device. PVT data monitoring will be done for complete duration of test with data frequency defined after IGN switch ON mode. VLT device shall function successfully during and after test.

j) *On vehicle dynamic location test*—VLT devices will be mounted on any target vehicle connected with vehicle battery. Target vehicle with VLT devices will be run for 10 km on pre-defined track/route to verify dynamic location test. VLT device PVT data shall be within ± 6.0 m for more than 90 percent of the fixed location data.

k) *SIM testing*—This test is to check the suitability of the SIM and communication module. The test shall be conducted to determine the effectiveness and operation of the GPRS module with OTA network switching capabilities on demand as well as automatically in real-time. The device would be tested to perform as per the protocol (*see*D-8.4**) using an embedded SIM/UICC. The GPRS module & SIM, shall support SMS and Data (GPRS, TCP/IP).

Acceptance Criteria: In the testing, vendors has to demonstrate the embedded SIM/UICC based tracking and multiple network OTA switching capabilities (On Demand as well as Automatic Switching on real-time basis) for effective network management and transmission.’

Amendment No. 1 to IS 16833 : 2018

(*Page* 72, *clause* **D-10.2**) — Substitute the following for the existing clause:

'**D-10.2** The number of emergency buttons and their positioning in different types of vehicles will be based on the length, seating and interior layout of the vehicles. One Emergency button will be installed within easy reach of the driver. Other emergency buttons will be installed in the vehicle on both sides, in such a way that they are within easy reach of the passengers such as every 2 m on both the sides of passenger seating area. In case of passenger transport bus which has a glass window covered between two pillars having pitch 2m or more, the emergency buttons shall be provided on each pillar.'

(TED 28)

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